



**Learning From
The Past...**



**...Surveying
The Future**



**CONRAD BLUCHER
INSTITUTE**
FOR SURVEYING AND SCIENCE

Low Cost UAS for Mapping via Google Application

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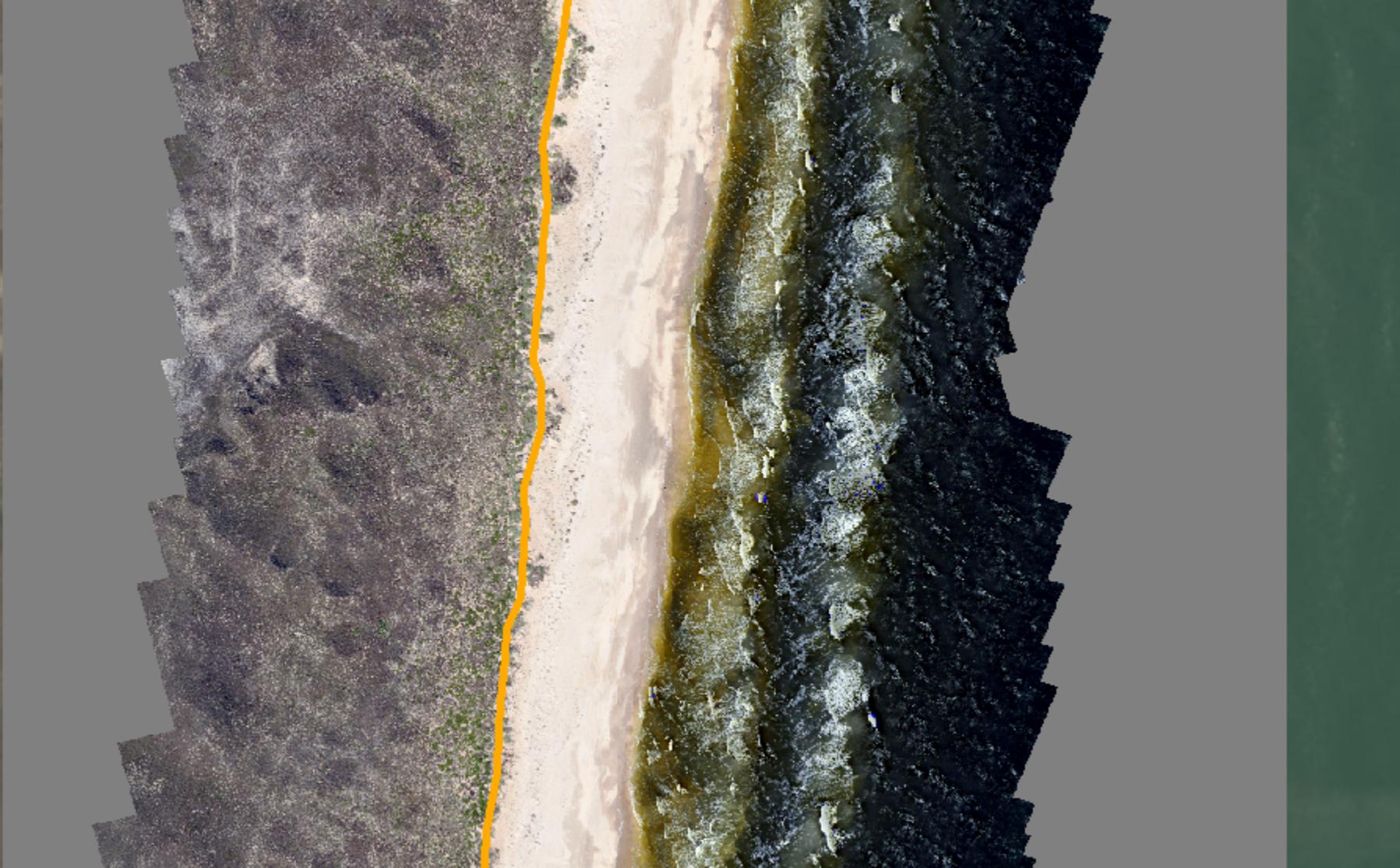
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UAS

- RS 16
 - 16' wing spread
 - 13,000' ceiling
 - 16 hour flight time
 - 25 pound load
- Photogrammetry Payload
- Direct GeoReferencing





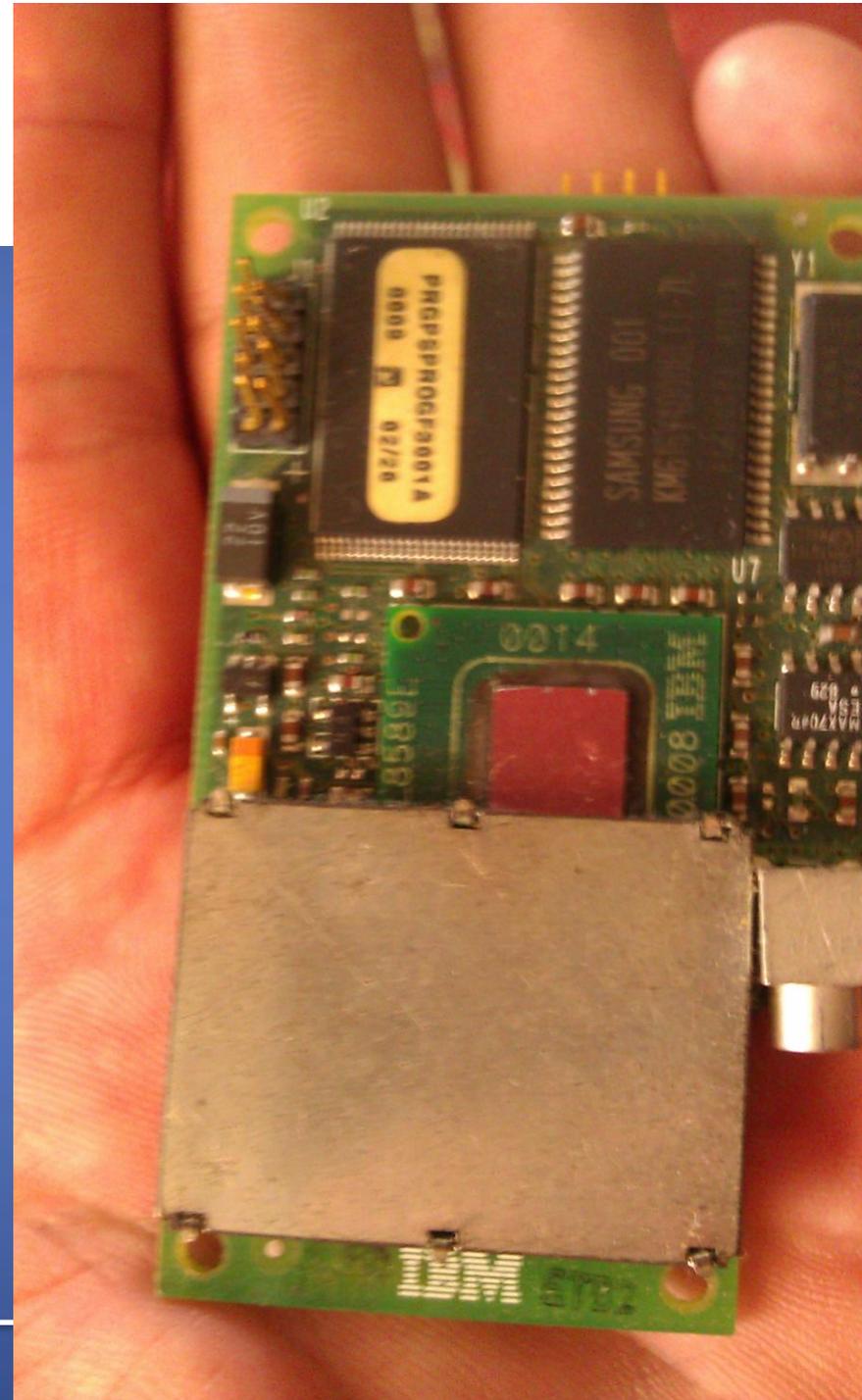


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Low Cost Drone

Micro GPS Sensor
L1 and L2
RTK
IBM Silicon Germanium SiGe

(Lyle and Wilson, 2000 Institute for
Navigation GPS 2000)



Low Cost Drone

Digital Imagery

- Direct Georeference with RTK GPS
- CCD/CMOS
- Full Frame Video
- RTK GPS 50 km baseline
- Shift, rotation, and scale

Field Test

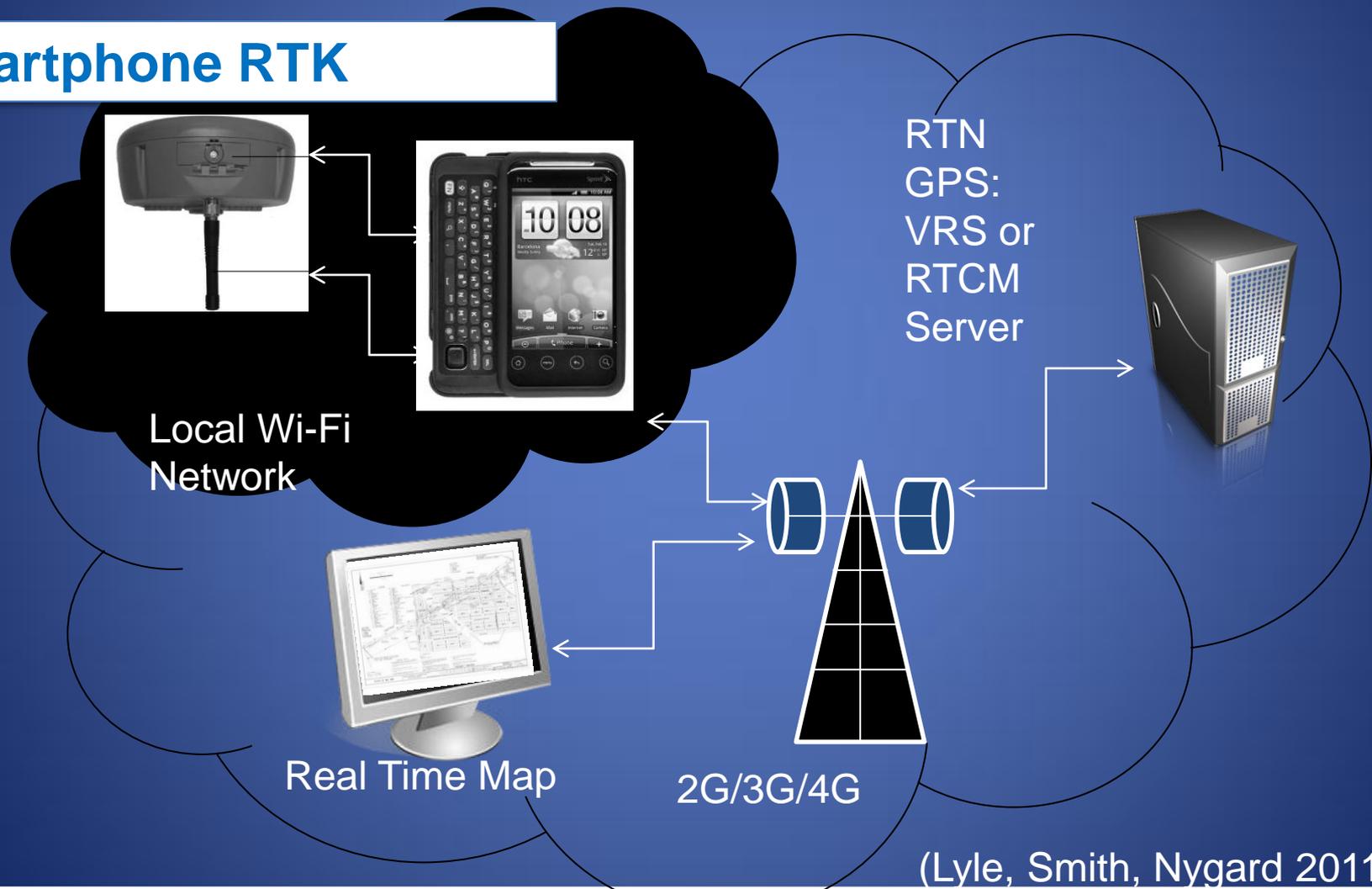
- NASA Rocket

(Lyle, 2007 NASA Tech Briefs)





Smartphone RTK

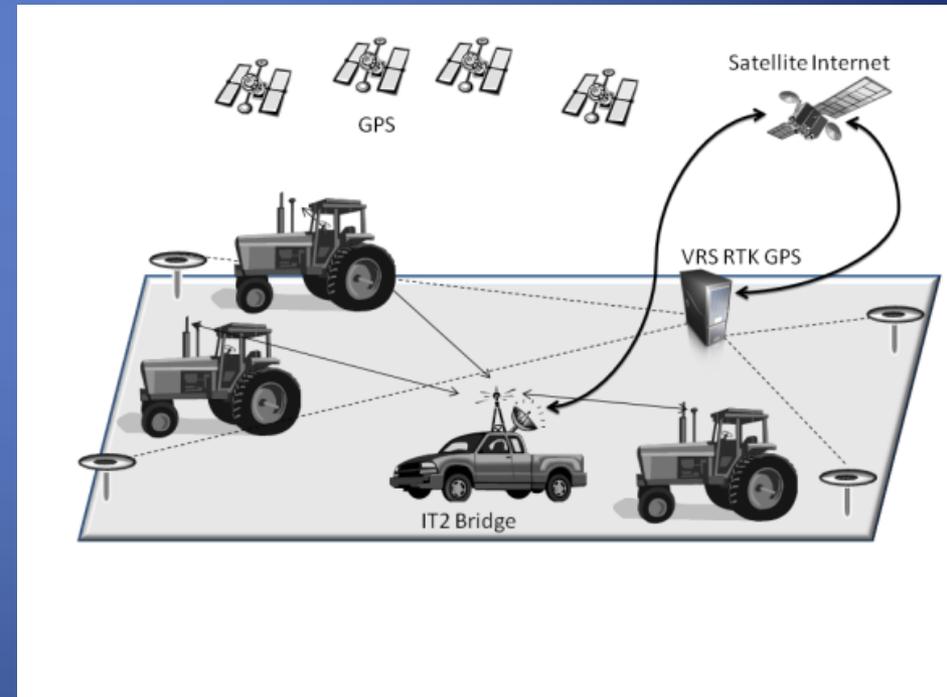


(Lyle, Smith, Nygard 2011, ION)

USDA: Low Cost Machine Control

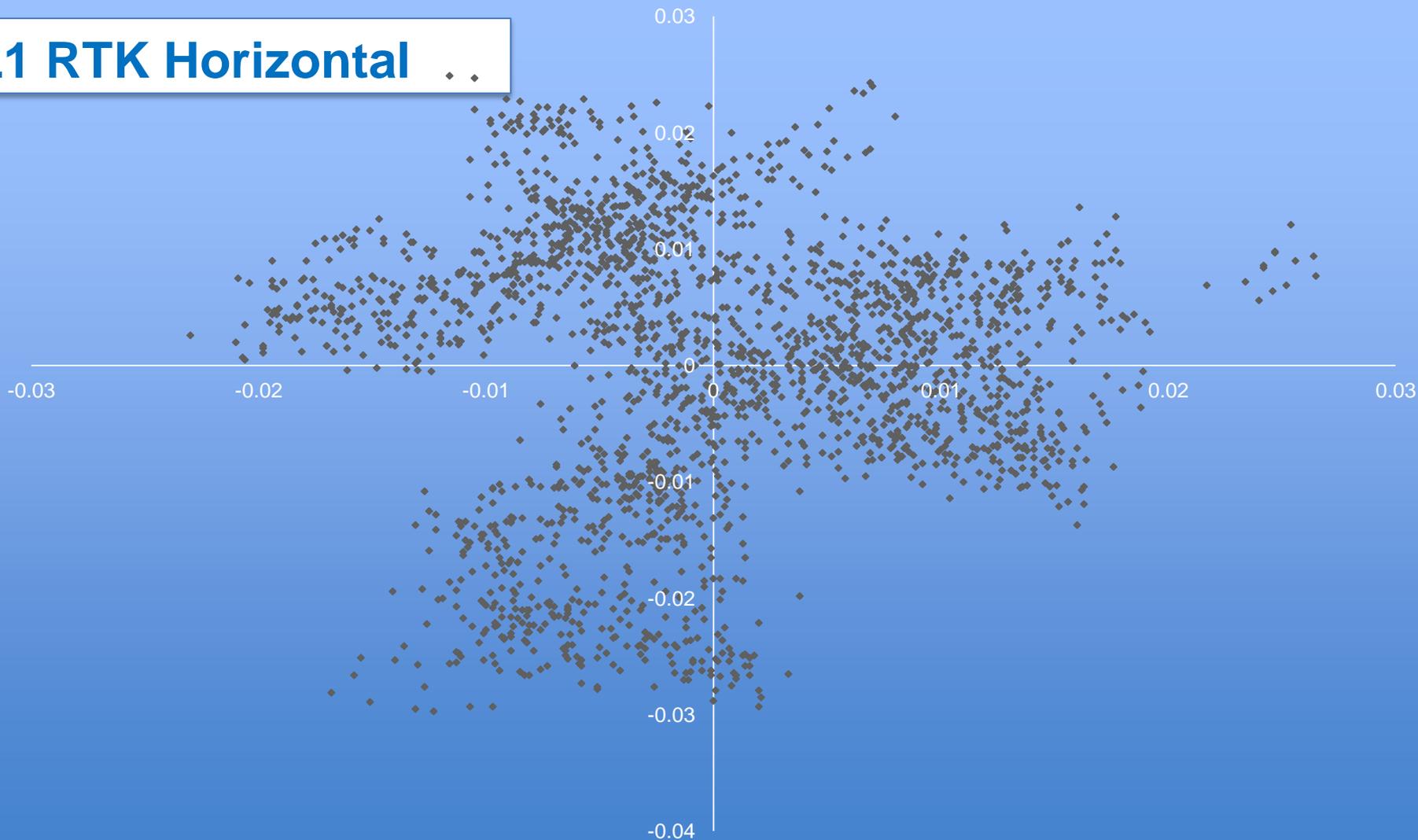
RTK Cellphones Solution
Ublox L1 C/A Phase
RTKLib
GeoRTK

(Lyle, 2013, *Experiment to test RTK
GPS with Satellite “Internet to
Tractor” for Precision Agriculture*
International Journal of Agricultural
and Environmental Information
Systems)



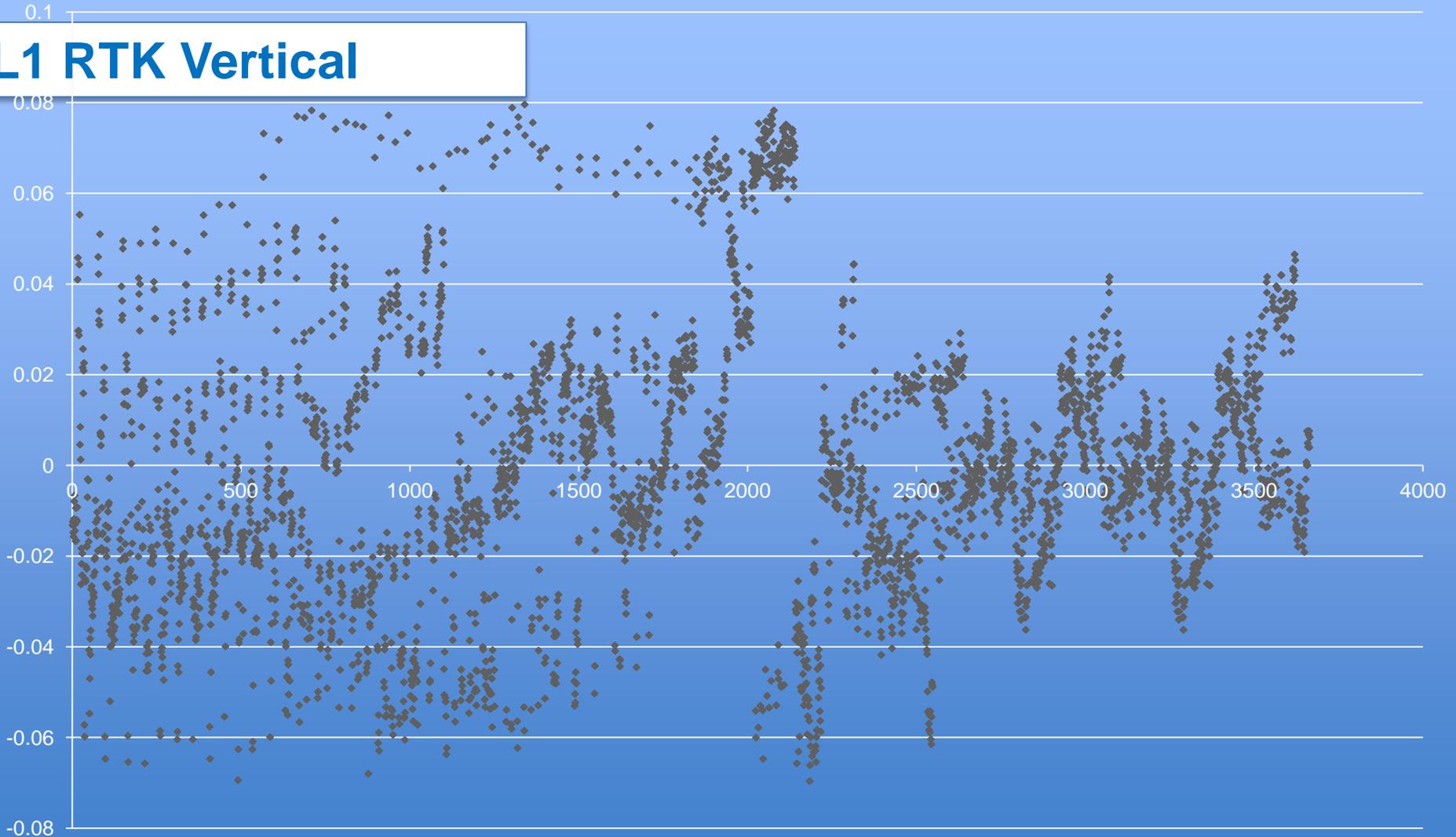


L1 RTK Horizontal





L1 RTK Vertical



Considerations

- DIY Drone- Open Sources
 - GPS Machine Control
 - 100 hz
 - Latency
 - Copter or Airplane
 - Autopilot
 - Mission Planning Software
- Arduino
 - Drone Control



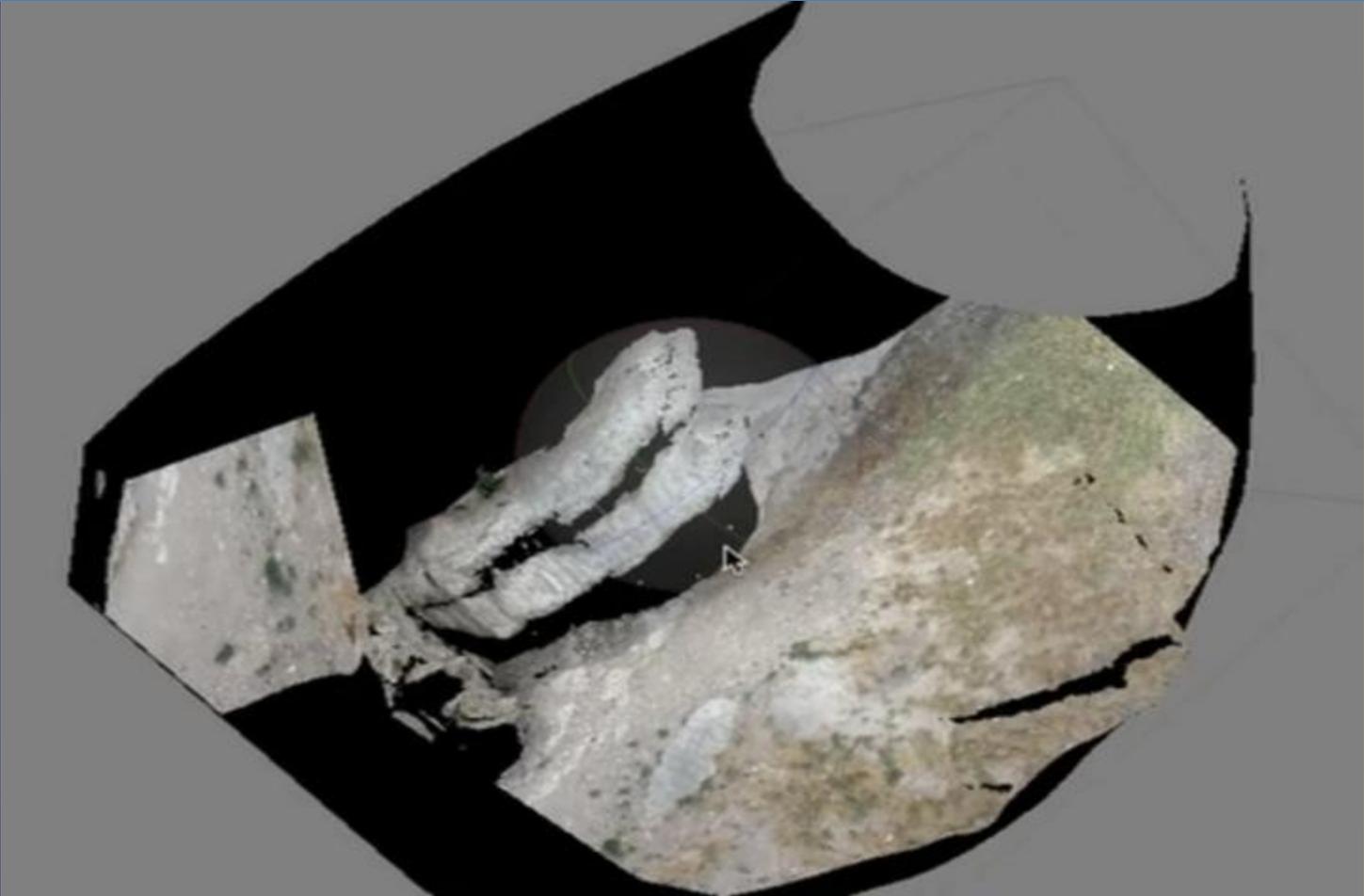
Application Steps

1. App starts- Settings
2. Survey Type
3. Start Job
4. Smart phone gets Position
 1. Wifi, AGPS, DGPS, PPP, or RTK
5. Surveying started with selected accuracy
6. Real Time Mapping and/or Control
7. App closed











**Office of Research and
Graduate Studies**

**Texas A&M University
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Thank You

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